

# Performance plots for tracking review sims

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# Goal

Evaluate performance of sPHENIX tracking configurations using:

- Inner barrel of 3 maps layers copied from ALICE ITS upgrade configuration
- Intermediate tracker of 4 silicon strip layers (**or not**)
- Outer TPC tracker with 60 gas layers

The inner barrel and intermediate tracker are simulated using cylinder cell geometry.

# Macro location

The tracking setup macro is:

G4\_Svtx\_maps+IT+tpc.C

It is located in:

[https://github.com/adfrawley/macros/tree/QTG\\_macros/macros/g4simulations](https://github.com/adfrawley/macros/tree/QTG_macros/macros/g4simulations)

The number of layers of each subsystem can be varied by changing:

```
const int n_ib_layer = 3; // number of maps inner barrel layers  
const int n_intt_layer = 4; // number of int. tracker layers  
const int n_gas_layer = 60; // number of TPC layers
```

If you set “n\_intt\_layer = 0” you get maps + TPC only.

# Plots

The plots are made using the macros:

purity.C // reads the SvxEvaluator output ntuples  
look\_purity.C // makes plots from purity.C output histograms  
plot\_comparison\_purity.C // compares plots from look\_purity.C

Located in:

[https://github.com/adfrawley/macros/tree/QTG\\_macros/macros/g4simulations/analysis](https://github.com/adfrawley/macros/tree/QTG_macros/macros/g4simulations/analysis)

The cuts used when analyzing the reconstructed tracks from the ntuples are:

quality < 1.5  
dca2d < 1 mm  
dcaZ < 1 mm

# Simulations

All simulations shown here use central Hijing events with 100 embedded pions each.

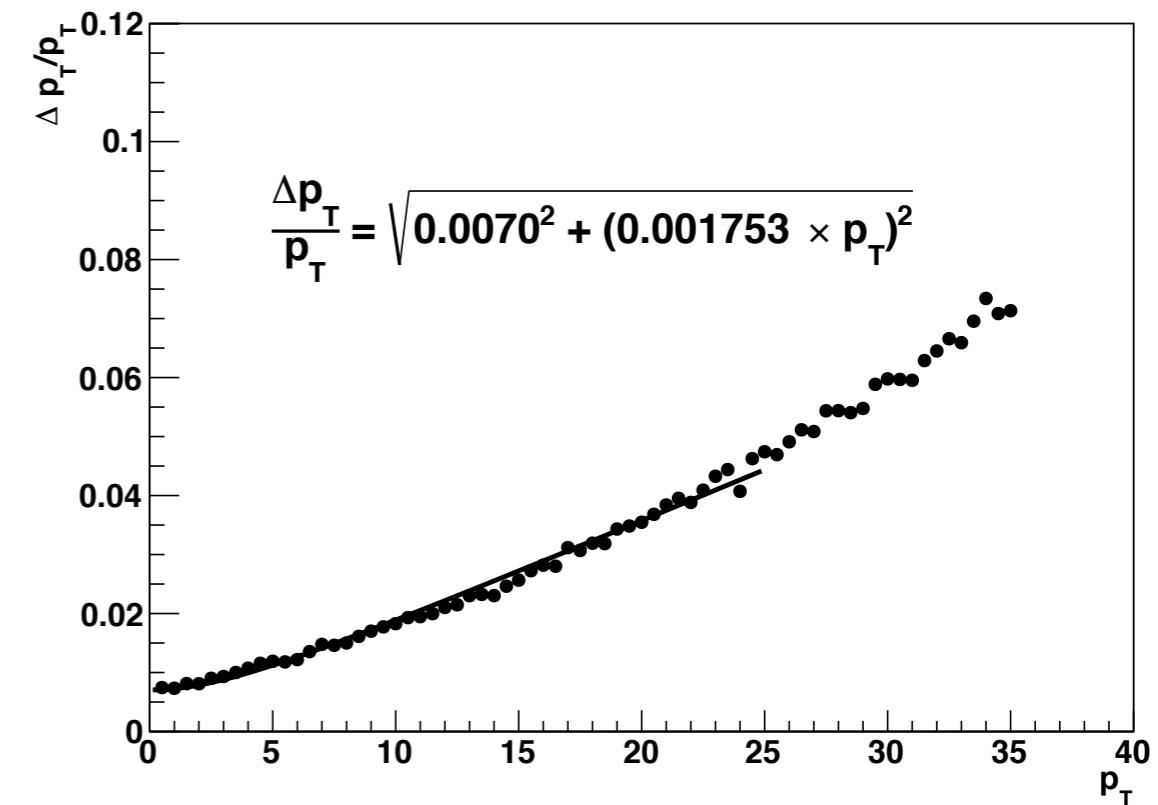
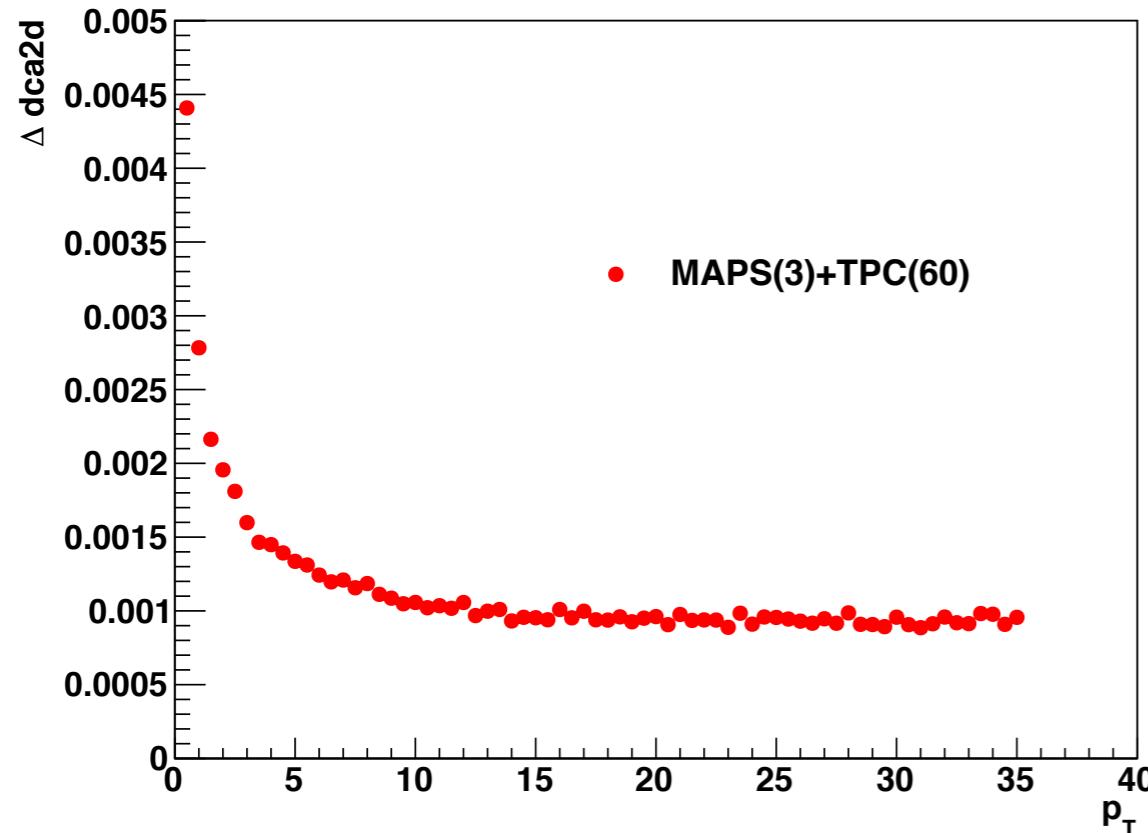
The embedded pions have quantized  $p_T$  values from 0.5-50 GeV/c in steps of 0.5 GeV/c.

The  $p_T$  and dca2d resolution plots are made from embedded pion tracks only.

The single track efficiency plots are made from embedded pions only, using a  $4\sigma$  cut on reconstructed  $p_T$ .

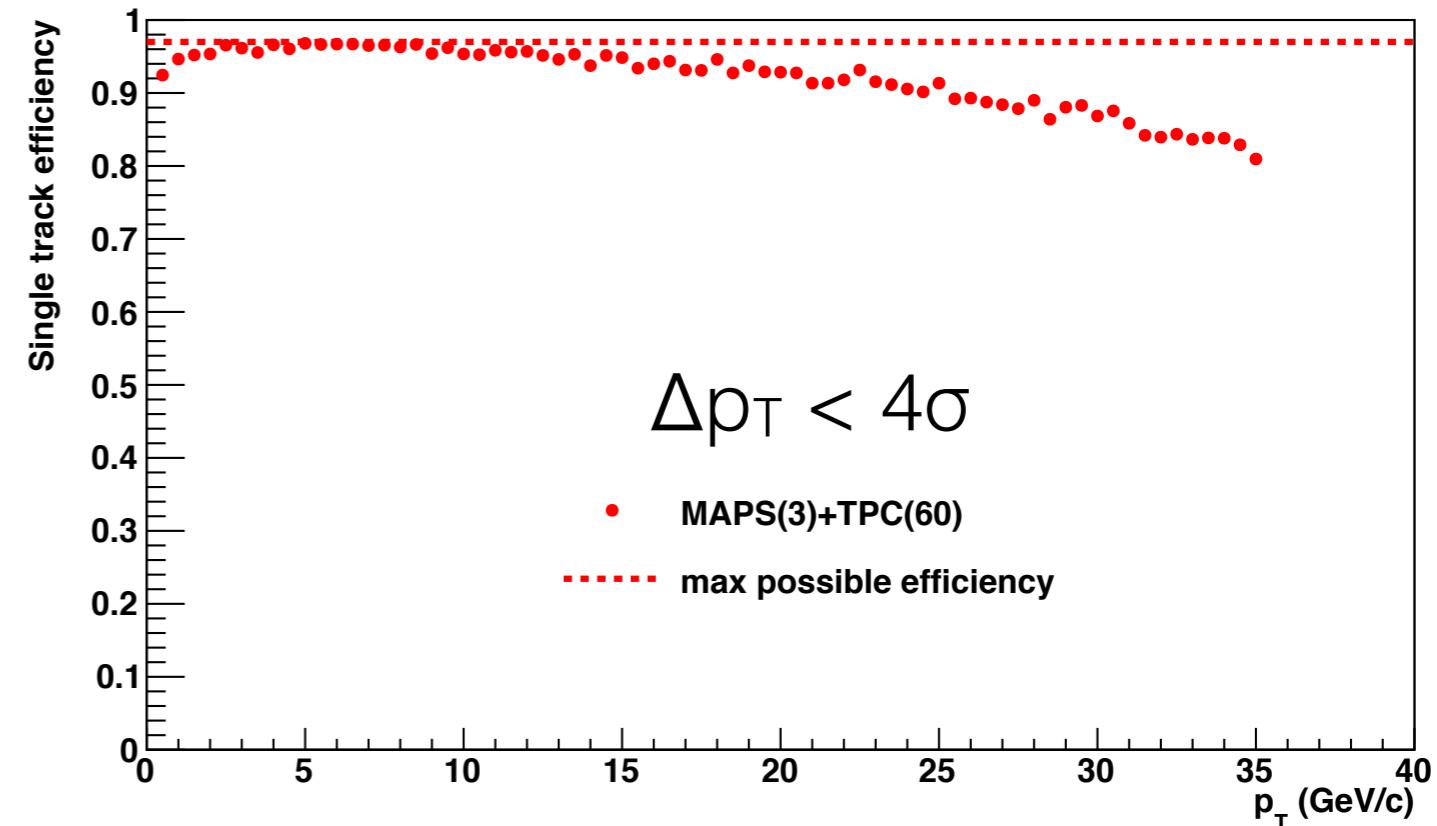
There are also DCA distributions and purity plots made with Hijing tracks only.

# Maps(3)+TPC(60) performance plots

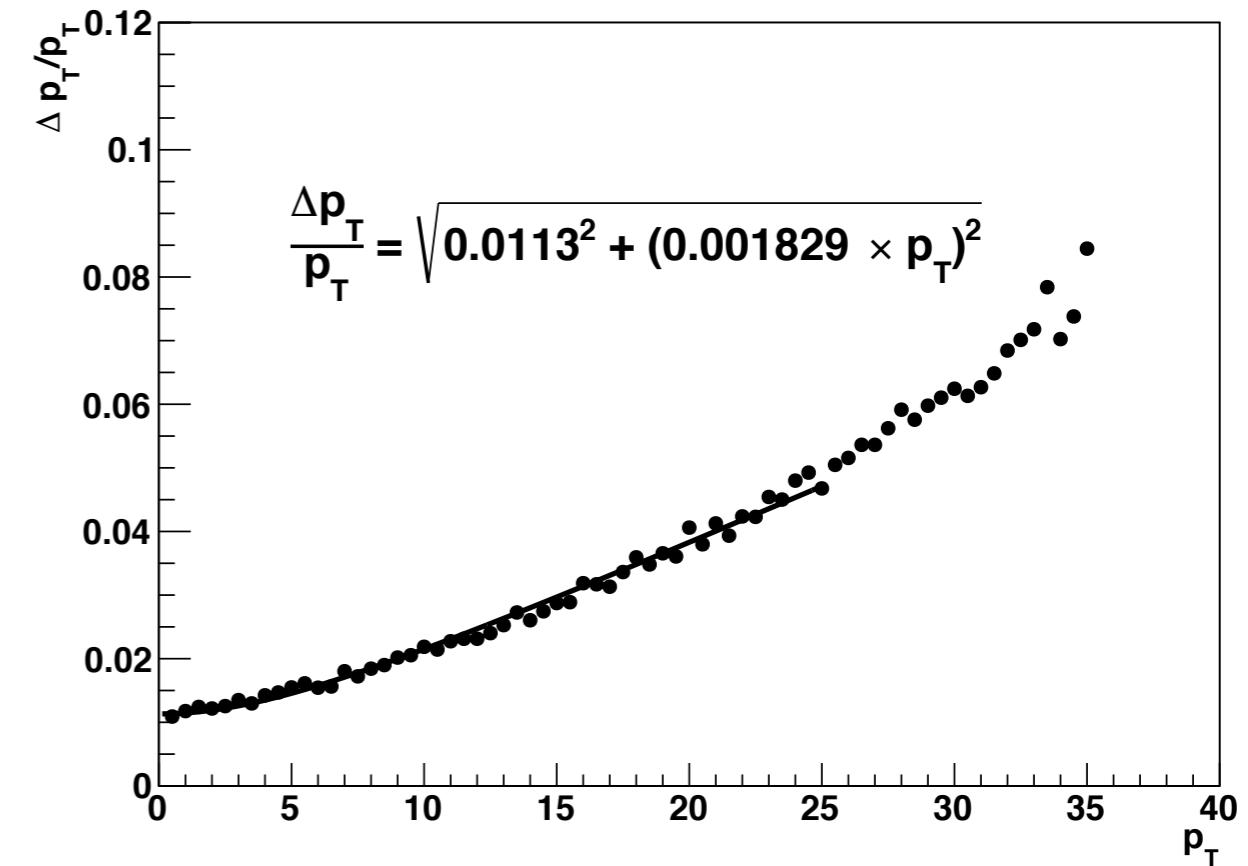
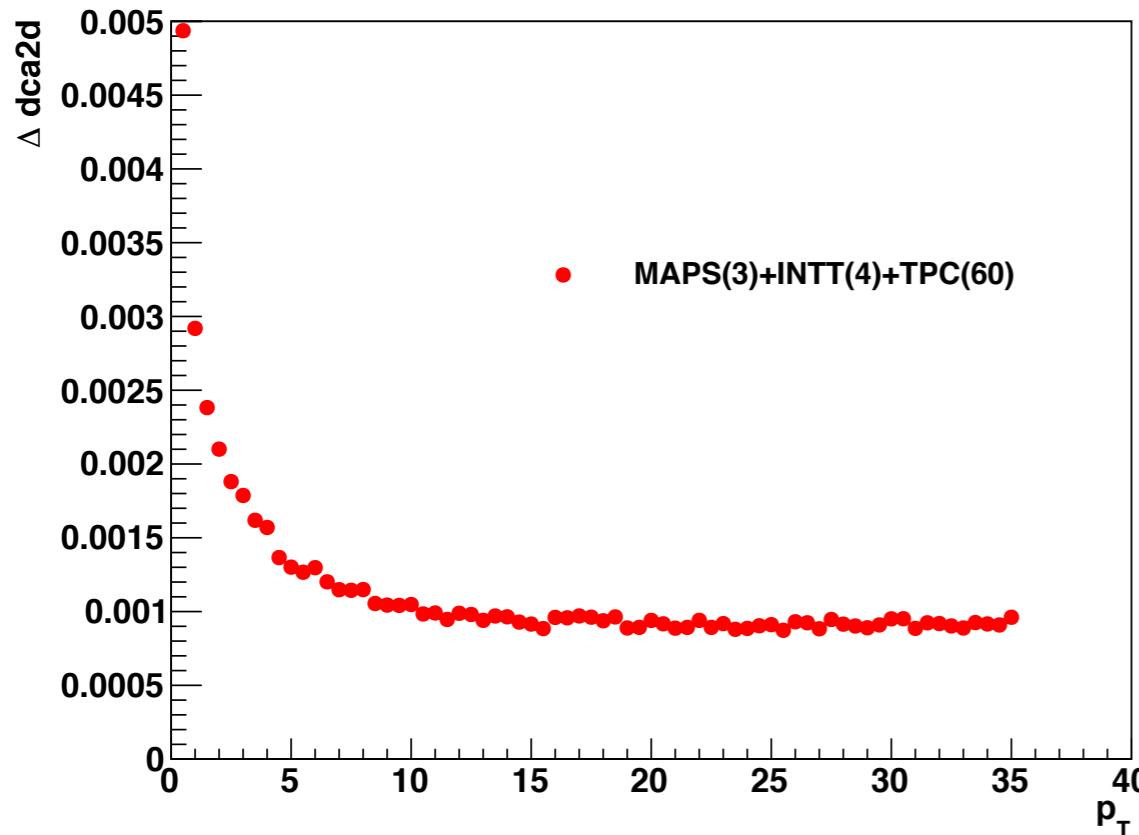


embedded pions only  
central Hijing  
+ 100 pions/event

quality < 1.5  
 $dca2d < 1$  mm  
 $dcaZ < 1$  mm

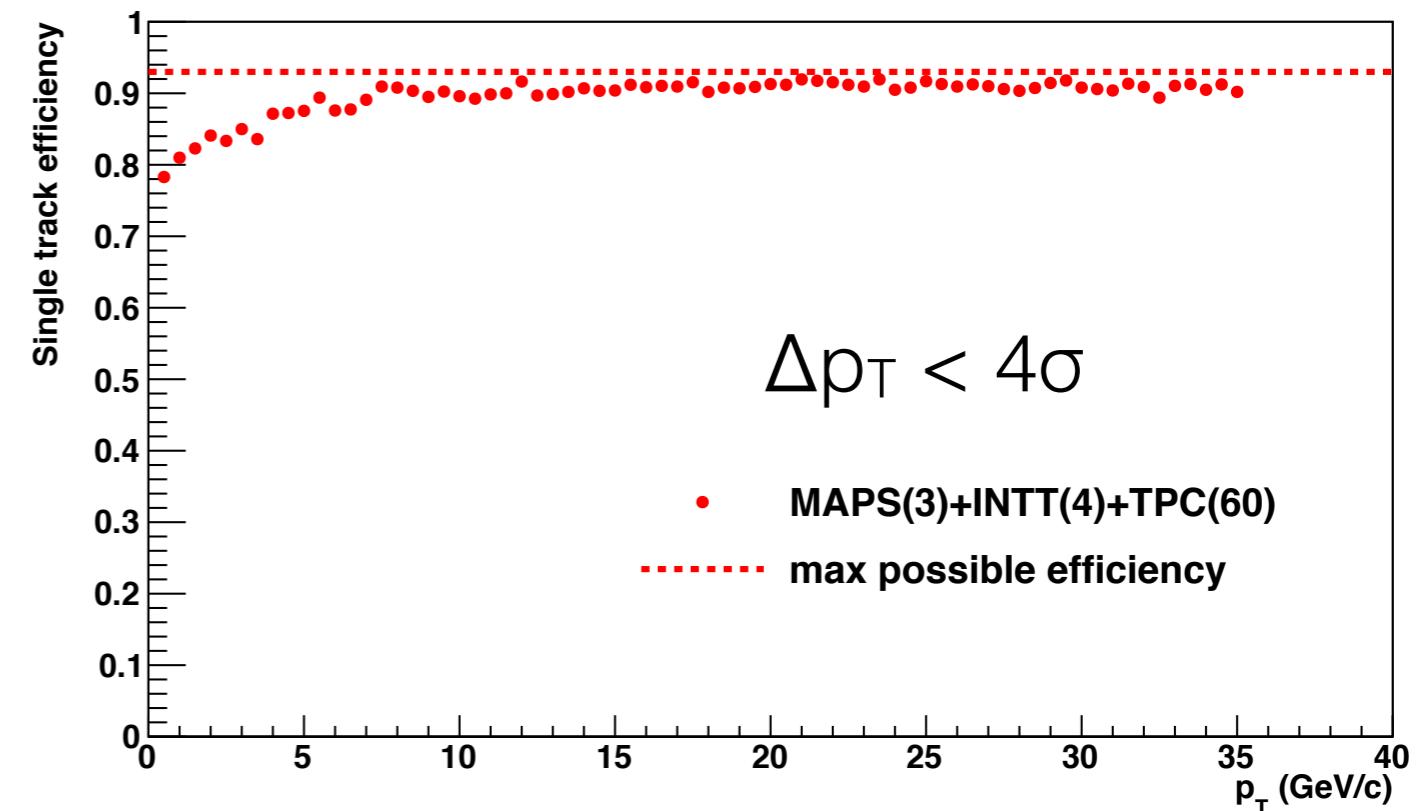


# Maps(3)+INTT(4)+TPC(60) performance plots



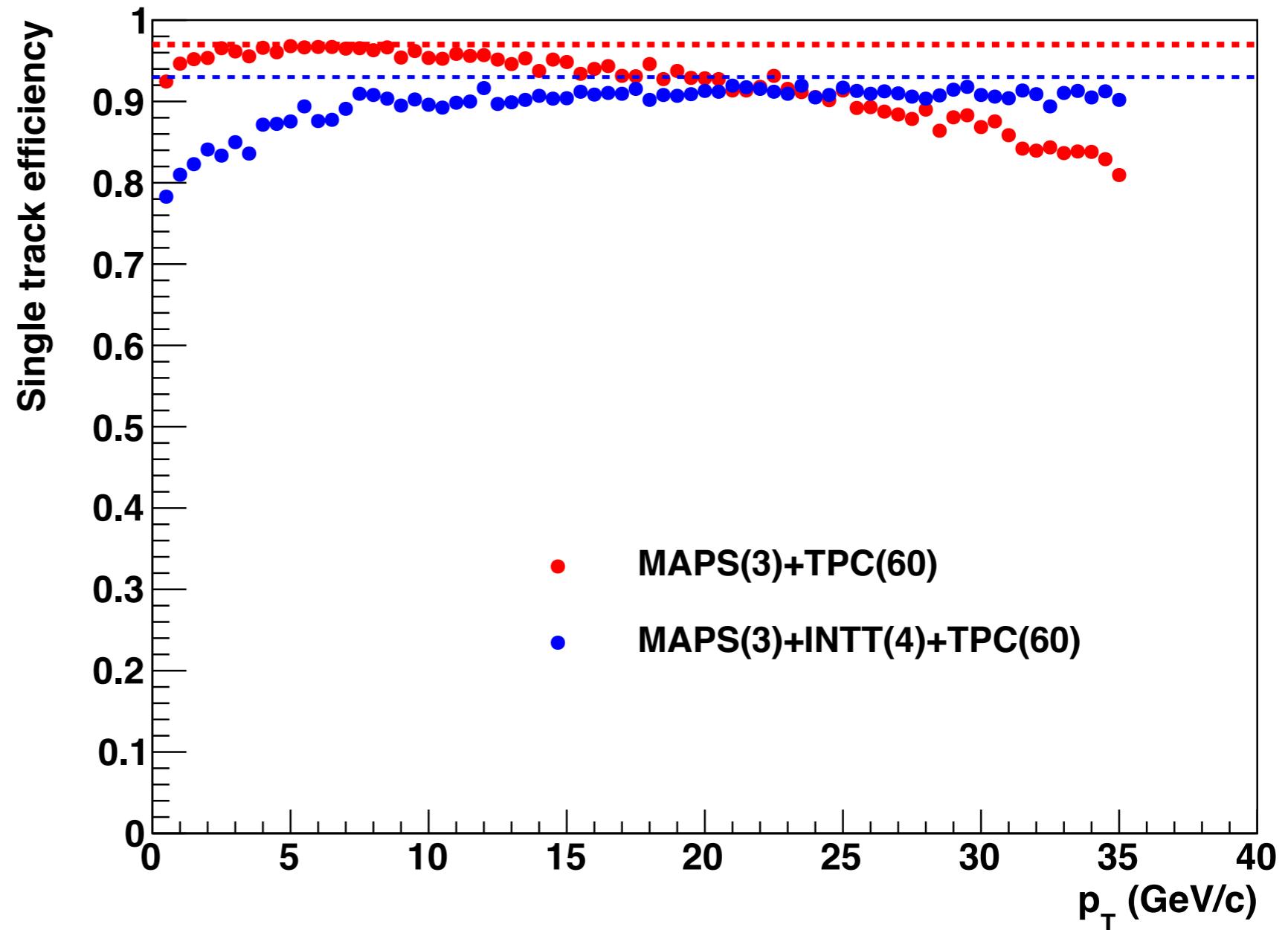
embedded pions only  
central Hijing  
+ 100 pions/event

quality < 1.5  
 $\text{dca2d} < 1 \text{ mm}$   
 $\text{dcaZ} < 1 \text{ mm}$



# Comparisons - single track efficiency

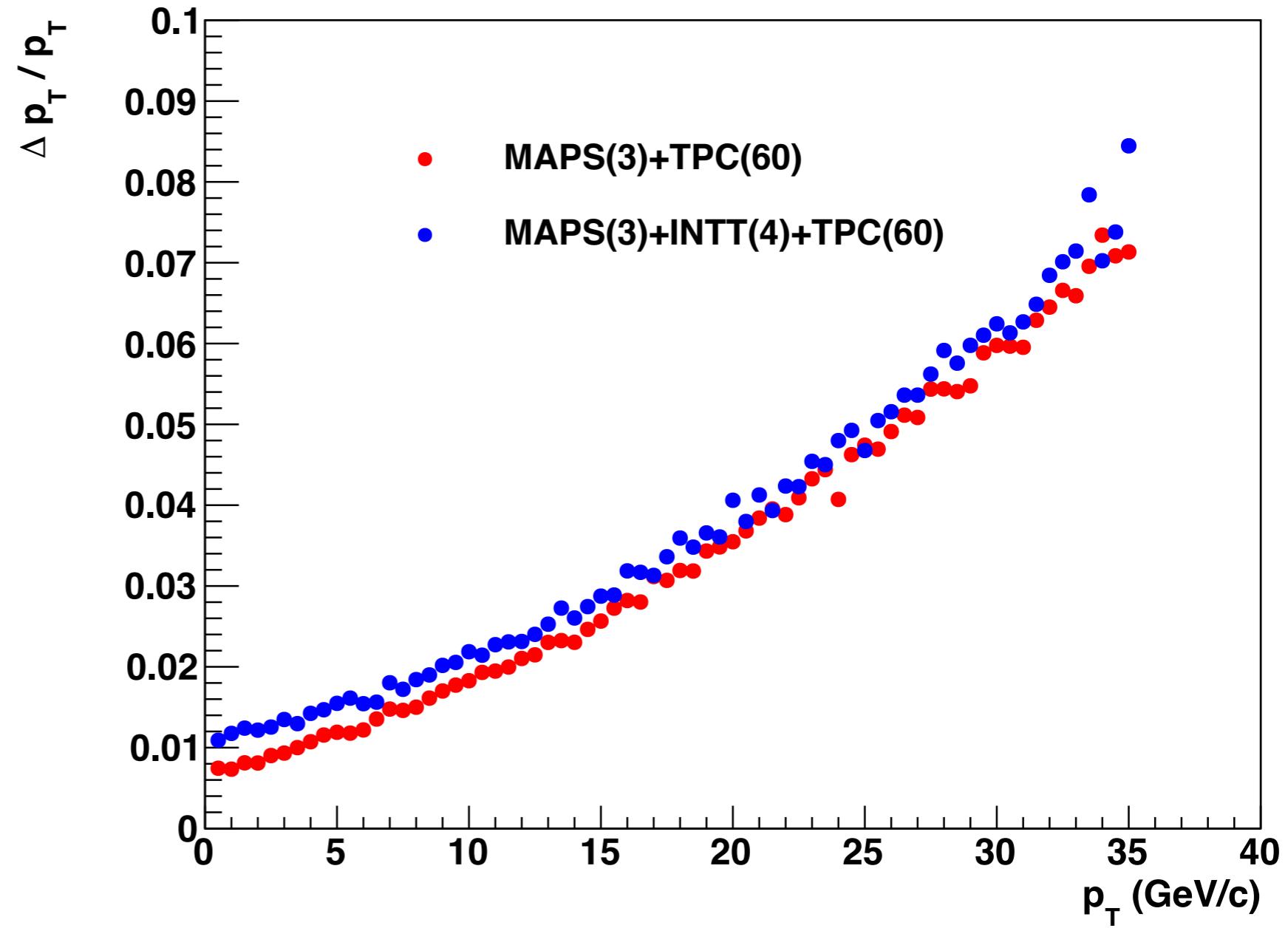
Fraction of **truth**  
tracks  
reconstructed  
within  $4\sigma$  in  $p_T$



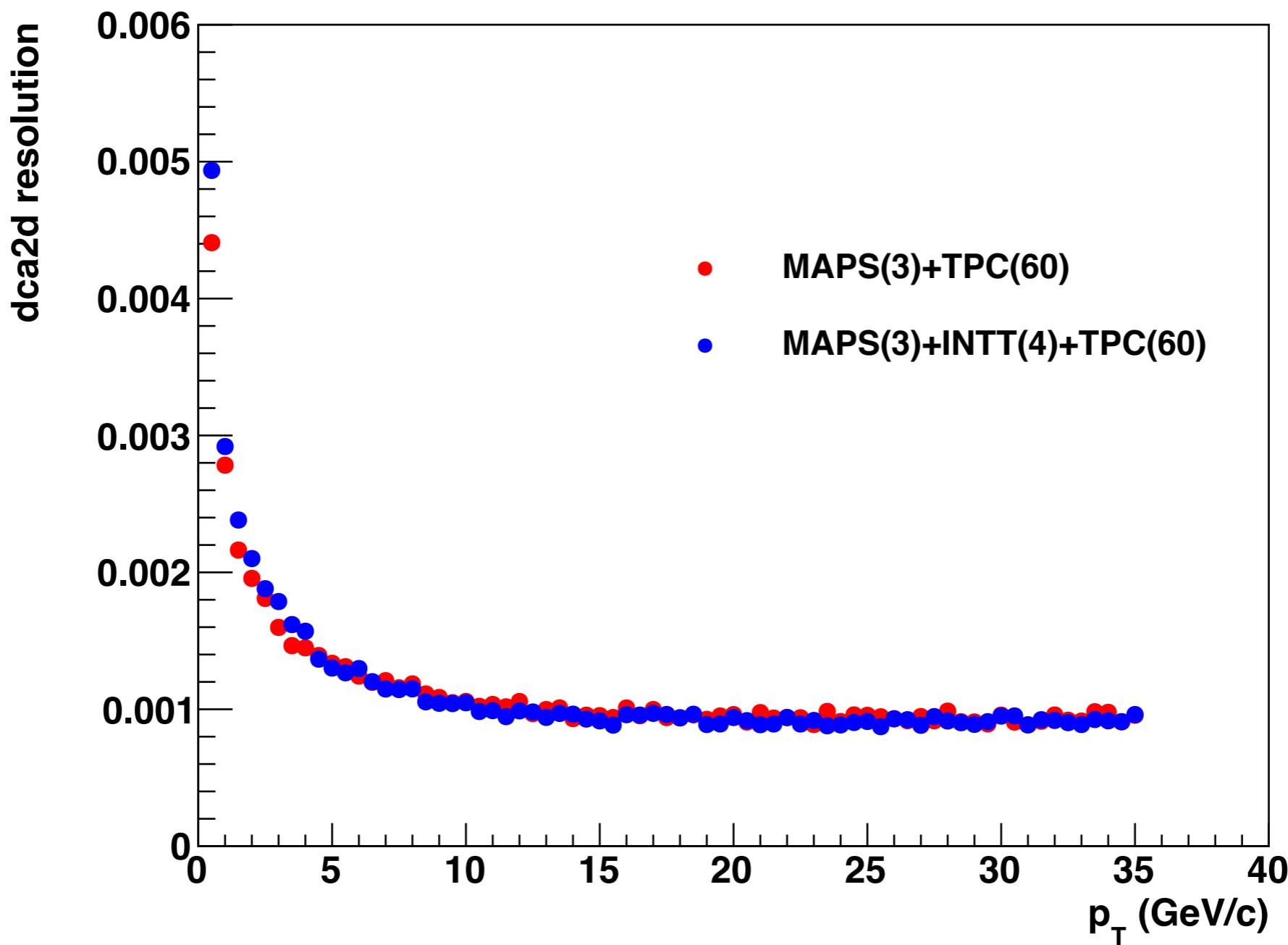
# Comparisons - $p_T$ resolution

Fits to  
distributions of

$$(\text{truth } p_T - \text{reco } p_T) / (\text{truth } p_T)$$

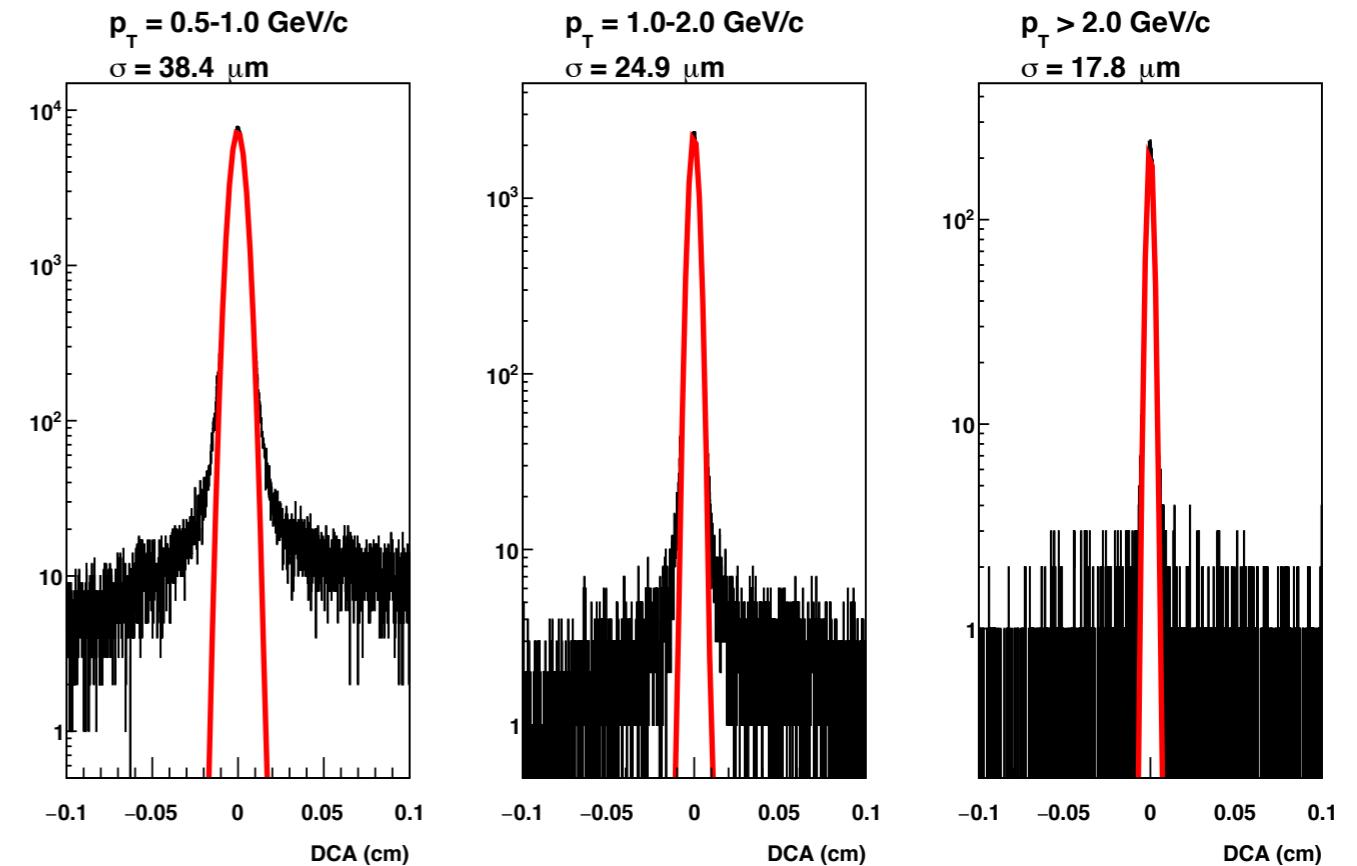


# Comparisons - DCA resolution

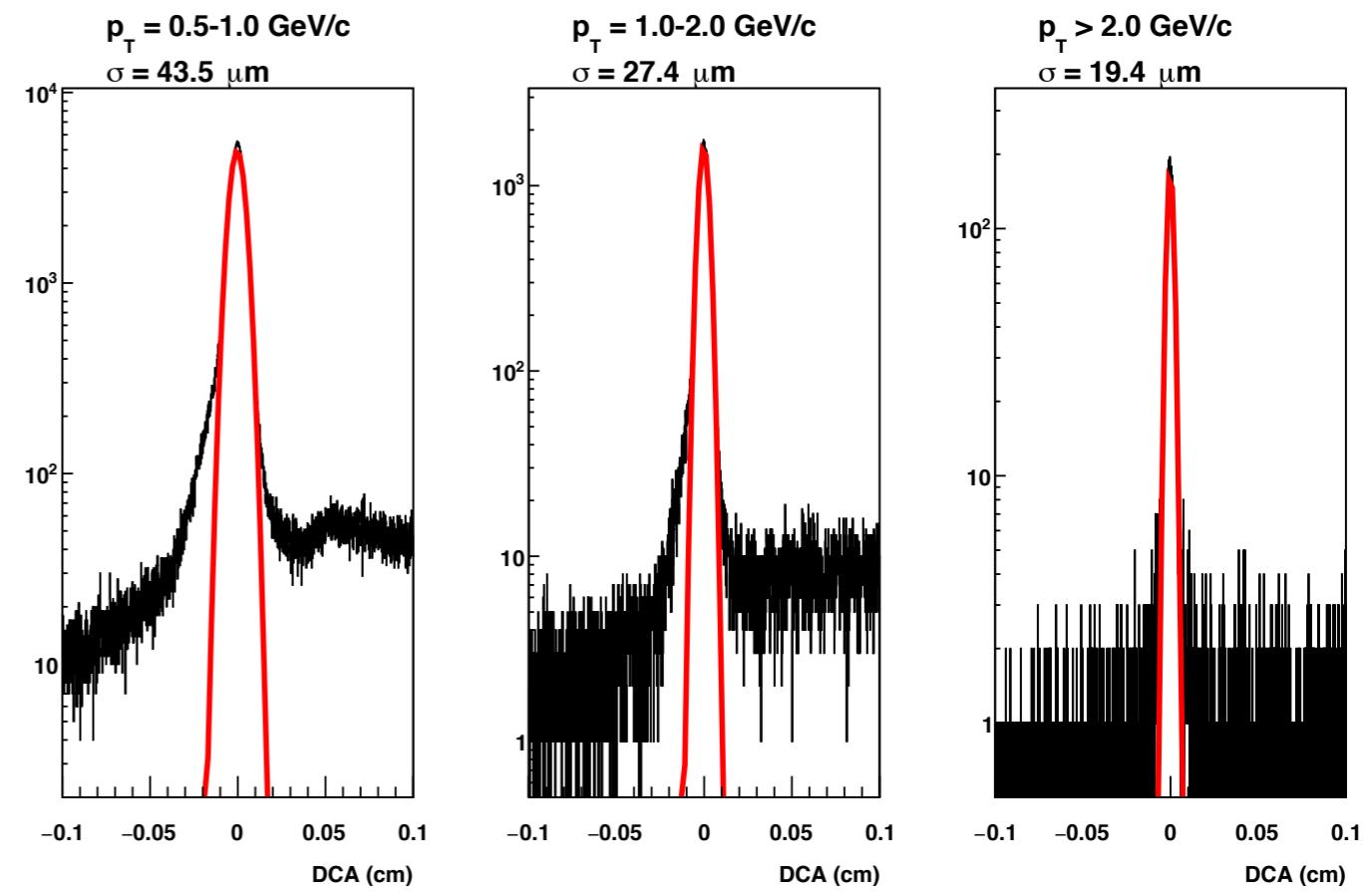


# DCA comparison (Hijing tracks only)

MAPS(3) + TPC(60)



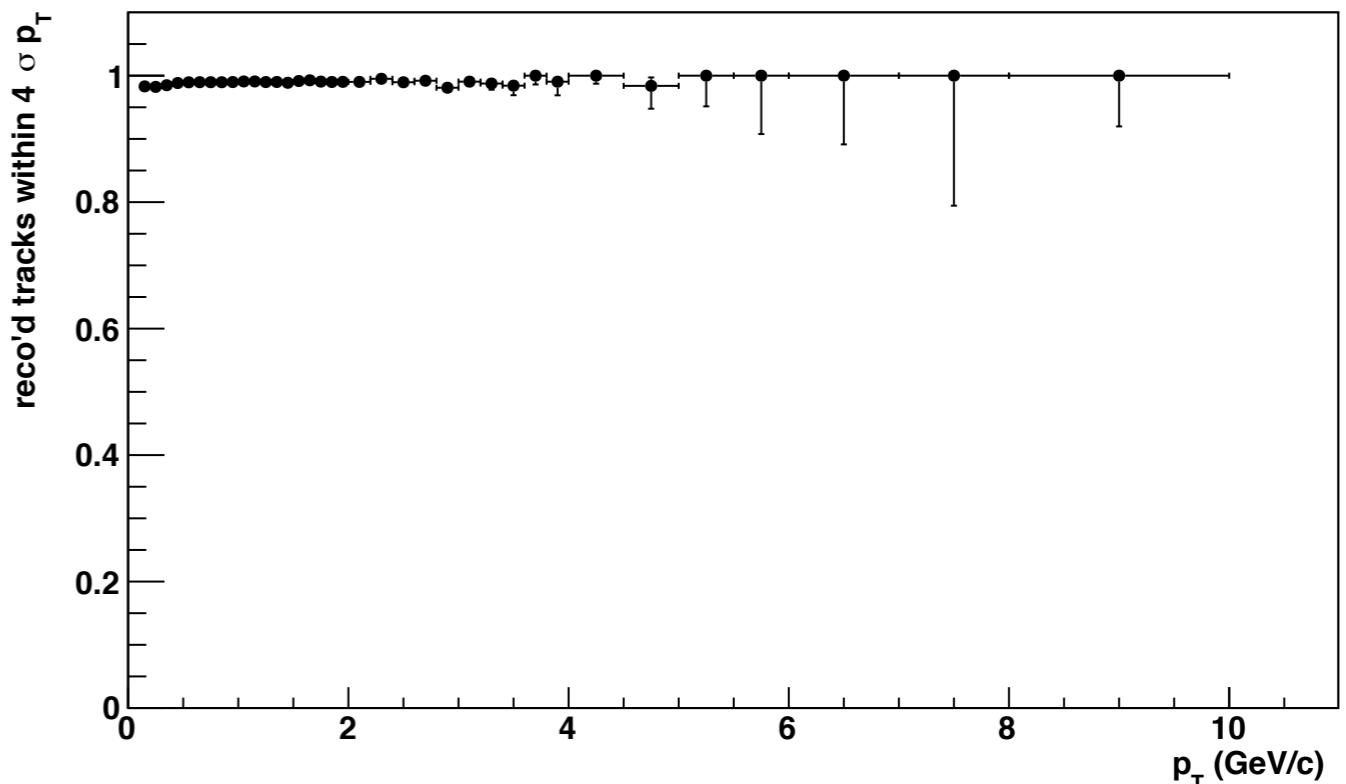
MAPS(3) + INTT(4) + TPC(60)



# Purity comparison (Hijing tracks only)

MAPS(3) + TPC(60)

Fraction of  
reconstructed  
tracks within  $4\sigma$   
of truth  $p_T$



MAPS(3) + INTT(4) + TPC(60)

